

**COURTSHIP AND DIET OF THE NEOTROPICAL ROBBER FLY
MALLOPHORA SCHWARZI CURRAN
(DIPTERA: ASILIDAE)¹**

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Except for Curran's (1934) original description of the species based on specimens from Barro Colorado Island in the Panama Canal, and reports of individuals from Cerro Campana, Panama, and Madden Forest, former Canal Zone (E. Fisher, pers. comm.) there are no published accounts on the biology of *Mallophora schwarzi*. The present observations were made 3 km northwest of Gamboa, former Canal Zone, on a hillside that had been largely cleared by the U.S. Army. Although occasionally seen on tall grass blades, individuals of *M. schwarzi* were most regularly seen on branch tips of shrubs and trees that bordered the cleared space.

All observations were made between February 20 and April 21, 1979. No *M. schwarzi* were seen prior to February 20 during weekly visits to the site conducted since October 1978 (M. Greenfield, pers. comm.). Peak abundance was noted on March 11 when 20-25 mating pairs and numerous solitary individuals were observed in a 2 hr period. Following this mid-March peak, numbers declined steadily. On April 21 we saw only 1 individual, and on June 18 no *M. schwarzi* were seen. Thus the flight period of *M. schwarzi* appears limited to the 2 months from mid-February to mid-April.

Mallophora schwarzi is a robust species whose members resemble certain euglossine bees of the genus *Eulaema* (E. Fisher, pers. comm.). Individuals vary from 20 to 23 mm in length. Dense, orange pile on abdominal segments 2-7 contrasts sharply with the shiny, black face and black pile of the thorax, the first abdominal segment, and the anterior pair of legs. The sexes exhibit dimorphism in that the hind legs of the female are totally black-haired, whereas in the male the venter of the apical half of the hind femora and the venter and side of the basal $\frac{2}{3}$ of the hind tibiae are covered with relatively long, white hairs.

Males of Curran's type series (from Barro Colorado) also possessed abundant white hairs on the metatarsi and males observed near Gamboa, although similar to the type series, lacked such white hairs. In addition, a male recently captured on Barro Colorado (March 1980) also lacked these white, metatarsal hairs. Consequently, *M. schwarzi* males are here considered to be polymorphic with respect to the presence or absence of white, metatarsal hairs.

Courtship

Courtship and mating occurred with greatest frequency between approximately 0900 hr and 1200 hr. Individuals were seldom active before 0800 hr at which time they were first seen perching on branches exposed to full sunlight. Individuals rarely exhibited mating behavior in the afternoon but during this time appeared to be primarily engaged in foraging activity.

Courtship proceeded as follows. A flying male approached a perching female and hovered approximately 7 to 15 cm above and behind her. From this position the male made repeated approaches to and withdrawals from the stationary female. Thus, the male appeared to be bobbing up and down slightly above and behind the female. Throughout this movement, the male's anterior pair of legs were held against the thorax, while the hindlegs were widespread. In the majority of the male's approaches no contact was made with the female. However, in some approaches the male contacted the female's wings (which were resting directly over her abdomen) with a forward movement of his hindlegs, flicking her wings away from her body into a spread position. This wing flick was extremely rapid, since the male withdrew immediately and continued the bobbing behavior. Sometimes, before approaching the female, the male hovered and rubbed his hindlegs over its posterior abdominal segments. Following 2–4 such grooming actions, the male resumed approach-withdrawal activity. This bobbing behavior with occasional wing flicking lasted 3–4 minutes at the longest and was interrupted only by the male grooming behavior. All observed courtship behavior ended with the female suddenly flying away and the male following. Thus, although copulating pairs were observed, not one observed courtship display was seen to result directly in copulation.

Diet

Mallophora schwarzi are sit and wait predators that attempt aerial capture of passing, flying insect prey. Individuals perch in open, conspicuous sites on grass blades and woody branch tips at heights of 50–310 cm. Although most foraging flights were less than 1.0–1.5 m long, several flights of 2–3 m were observed.

M. schwarzi is a dietary specialist on Apidae, Vespidae, and Sphecidae (Table 1). These 3 families alone comprised 90% of the recorded diet. Apidae constituted the major prey taxon (49%), and within the family 53% were members of the genus *Trigona*. The remaining prey included 2 ants, 1 reduviid, and 1 stratiomyid.

Mean length and wet weight values for all prey were 9.94 mm and 24.6 mg, respectively. Individual prey lengths varied 3.5 fold (17.6/5.0), and individual wet weights varied 119 fold (178.2/1.5). Distribution of prey lengths was not significantly skewed ($t = 1.74$; $P < .1$) but was highly leptokurtotic

Table 1. Prey of *Mallophora schwarzi*, February 20–April 21, 1979, near Gamboa, former Canal Zone.

Prey family	% diet (number recorded)	Length (mm) mean (range)	Wet weight (mg) mean (range)
Sphecidae	15 (6)	9.1 (5.0–17.6)	21.0 (1.5–59.2)
Vespidae	26 (10)	11.4 (8.1–15.5)	27.8 (2.5–58.8)
Apidae	49 (19)	9.0 (6.5–13.8)	22.5 (5.3–78.2)
Formicidae	5 (2)	11.8 (10.6–13.0)	32.4 (11.9–53.0)
Reduviidae	2.5 (1)	12.5	26.7
Stratiomyidae	2.5 (1)	8.5	29.0
Total	100 (39)	9.9 (5.0–17.6)	24.6 (1.5–78.2)

($t = 9.18$; $P < .001$). Conversely, distribution of prey wet weights was significantly skewed to the right ($t = 2.9$; $P < .01$) but did not differ significantly from normality with respect to kurtosis ($t = 0.13$; $P < .9$).

Discussion

The importance of courtship behavior in robber fly reproductive behavior varies greatly among species; for details of particular species see Lavigne and Holland (1969), Rogers and Lavigne (1972), Dennis and Lavigne (1975) and references therein. Certain species exhibit no recognizable courtship behavior. Males simply overtake females in the air, and the grappling pair falls to the ground and mates. In other species courtship may only involve male searching flights for females. More complex behavior may involve either (1) males hovering above females, (2) males hovering above females and making contact with them, (3) males palpating their fore legs on the substrate directly before the female, or (4) males performing intricate “dances” involving leg, wing, and abdominal movement.

In the 2 previous accounts of courtship in *Mallophora*, both Alcock (1974) and Copello (1922) described hovering, back-and-forth movement of males behind perched females for *M. faulx* Osten Sacken and *M. ruficauda* (Wiedemann), respectively. In addition, Copello (1922) noted a movement (no further description is provided) of the female's wings in synchrony with a forward movement of the bobbing male's hind legs. Copello (1922) proposed that the female moved its wings as an annoyance signal to discourage the male. In observing *M. schwarzi*, however, we clearly saw that female wing movement was actually induced by the forward movement of the male's hind legs. Given our observations and the observed synchrony in female wing movement and male leg movement in *M. ruficauda*, we suggest that male wing flicking behavior occurs in *M. ruficauda* as well.

Male contact with the female during courtship has been noted for only a few asilid species. In these previous accounts, males were always noted to

make contact by touching their fore legs to either the female's eyes, *Stichopogon trifasciatus* (Say) (Lavigne and Holland, 1969), wings, *Heteropogon wilcoxi* James (Lavigne and Holland, 1969) or head and thorax, *Cyrtopogon auratus* Cole (Wilcox and Martin, 1936). The wing flicking action described here for *M. schwarzi* males (and presumably for *M. ruficauda* males) is the first account of such courtship behavior in the Asilidae.

As E. Fisher (pers. comm.) has noted, unlike most asilid species, *M. schwarzi* (and all other *Mallophora* species) possess wings which are significantly longer than the abdomen. Access to a perching *M. schwarzi* female may thus require that the wings be spread. Wing flicking behavior could serve to provide the male with access to the female.

The tendency for *Mallophora* species to feed primarily (if not exclusively) upon bees and wasps has been observed in a variety of species (Bromley, 1930, 1946, 1950; Carrera, 1945, 1947; Carrera and Vulcano, 1961; Alex, 1947; Linsley, 1960; Clements and Bennett, 1969). With bees and wasps constituting 90% of its recorded diet, *M. schwarzi* clearly conforms to this generic pattern. Although no data were collected regarding available prey, the leptokurtotic distribution of prey lengths further reveals that *M. schwarzi* feeds upon a relatively narrow length range (62% of recorded prey were between 7–11 mm). In part, this result reflects the relatively high proportion (26%) of *Trigona* spp. in the diet. *Trigona* are slow-flying bees, and *M. schwarzi* may have relatively little difficulty capturing them. *Trigona* prey were all between 7–11 mm. The skewed distribution of prey wet weights, however, indicates that within this narrow length range, prey varied considerably in weight and that *M. schwarzi* was capable of capturing the heavier items. These comments upon prey selection are preliminary, however, and a detailed analysis obviously requires monitoring of available prey.

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Footnotes

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